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# THYSANOPTERA OF FLORIDA

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These insects are usually called thrips. They are all small, the largest measuring about eight millimeters (1/3 in.) in length while the smallest is scarcely half a millimeter. The vast majority are from one to two millimeters long. This is not as great a range in size as is common in other orders of insects. They are slender insects and their bodies are composed of four movable parts—the head, prothoraz, pterothorax (fused meso- and meta-thorax), and abdomen. This mobile structure enables them readily to squeeze into cracks in the bark of trees and into the parts of flowers where most of them live. Moreover the ten joints of the abdomen are loosely articulated so that the abdomen, like that of rove beetles, can be bent up over the back in a threatening manner as if the insect would sting. The real object of the motion is, in most cases, to straighten out the hairs of the wings preparatory to flight.

Each of the four parts of the body bears appendages. On the head are the antennae, always long and slender and composed of from seven to nine segments and capable also of a large range of motion. The comparative lengths of these antennal segments are much used in classifying thrips. On the antennae are hairs and spine-like organs. Some of these are "sense cones", probably organs of smell and perhaps of hearing.

Large compound eyes are present and near them usually three small simple eyes, ocelli. The anterior one of these frequently is directed forward and the others upward.

The mouth parts are of the sucking type and not rasping as is sometimes stated. However, the punctures they make in the tissues attacked are usually numerous and close together, giving to the injured tissues somewhat the appearance of having been rasped away. A peculiar characteristic of the mouth parts is the lack of symmetry between the two sides. The right mandible is entirely missing.

Although some species are wingless, there are usually two pairs of similar wings. Each consists of a long and rather narrow membrane fringed with very long hairs. These hairs are responsible for the name Thysanoptera, "fringe wings". In many species there are from three to twenty or more hairs of a second row present near the end of the front wings.

The body is usually provided with a few stout hairs or spines. These are most numerous towards the end of the abdomen but many species have prominent ones on the angles of the thorax and often a long stout one (post-ocular) some distance behind each eye.

The legs end in peculiar expansile membranes which are responsible for an older name of the order, Physopoda, or "bladder-feet".

There are two quite different types of ovipositors, a long saw and a softer membranous tube. Those thrips having the latter type are placed in the sub-order Tubulifera. Those having the saw in the sub-order Terebrantia and in the family Æolothripidae or Thripidae, according to whether the ovipositor is turned up or down.

This order of insects is most closely related to the true bugs, Hemiptera, and was formerly placed in that order.

HABITS. Most species are plant feeders. They suck the sap from the more tender parts of the plants. Some are predatory on other small insects and mites. One of our Florida species—may his tribe increase—feeds on the eggs and crawlers of white-fly. All thrips are of potential economic importance.

LIFE HISTORY. As a typical life history we may give that of our most common species, the Florida Flower Thrips. The eggs are laid in the tissue of tender plants just below the surface in a shallow slit made by the female. They hatch in about three (2-4) days. The larvae feed and grow for an average of 15 days (the minimum was ten and the maximum 24 days in summer), molting three times. The last immature stage is the pupa. This is peculiar. Like insects with a complete metamorphosis, thrips do not feed during this time and move about but little. But like their relatives, the bugs and other insects with an incomplete metamorphosis, the wing pads are present during this stage. Their development is thus intermediate between the two types. A final molt and the adult appears full-winged and with fully developed reproductive organs. The females feed for about five days and then begin to lay eggs. The completed life history therefore covers about 23 days. This would allow 16 generations per year. But breeding ceases altogether during the coldest weather of our winter and proceeds much more slowly during the entire winter. There is not a month of the year, however, during which breeding is entirely suspended. After a warm spell in even January one can find at least a few young in roses and other favorite flowers. They do not hibernate, but are equiescent during the coldest weather. Further north thrips hibernate in either the adult, egg, or larval stages.

Parthenogenesis is common. Indeed in many species no males have ever been seen.

ENEMIES. Thrips seem to be exceptionally free of predaceous enemies. They are apparently too insignificant to figure in the commissary arrangements of other animals. An internal parasite has been recorded, a hymenopteron, but it is not common. A fungus disease or two have been observed, and a small bug *Triphleps insidiosus,* feeds on them. But the chief factor in keeping down their numbers is heavy dashing rain, which beats them from the plants and pounds them to death on the ground.

This order of insects has been but little studied by resident entomologists of Florida. Mr. A. C. Morgan of the U. S. Bureau of Entomology, has done considerable collecting in the State, aided by Mr. Runner, and has described several species. Mr. J. D. Hood of the U. S. Biological Survey, has described several Florida species.

Prof. A. L. Quaintance and the late H. M. Russell, both of the Bureau of Entomology, have studied some species of economic importance. The writer has collected in this group only incidentally while working on some species injurious to plants of economic importance. The present list includes all the species the writer has collected in the State with the exception of two or three apparently new species of which he has not as yet been able to collect sufficient material for description. There has also been included in this list all the species that have been listed by other collectors as taken in the State. Many of these specimens the writer has not seen, and he assumes no responsibility for the correctness of their identification. But as they have all been listed by careful workers, they are doubtless mostly correctly identified. Those records that have thus been compiled from the publications of others are indicated in the text with the name of the collector and a reference to the publication in which the collections were recorded. When the name of the col-

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lector is not indicated, the collection and identification are those of the writer.

This should be considered as preeminently only a preliminary list and by no means complete. It is thought, however, that it includes all species that have been recorded in entomological literature as occurring in the State. The only locality in which the writer has done systematic collecting is that about Gainesville, and even this small area is by no means exhausted.

Nevertheless the list contains more than four times as many species as Smith lists in his "Insects of New Jersey". When one considers that in most orders of insects the New Jersey list is much larger than the corresponding one of Florida (not because New Jersey has more species but because it has been more thoroly worked than Florida), it becomes evident that Florida is rich both in species and individuals as compared with states further north.

In addition to notes on the distribution, food plants, season, and habits of our Florida species, this list contains keys to the species in general to which the author has added new species. This seems desirable because no adequate keys are in existence. These keys have in most cases been modified from those of other authors and unless otherwise indicated from Moulton (1911). There has been appended bibliography of those works found most useful in the study of our Florida species and all papers in which Florida captures have been recorded. Any one wishing to identify our species for himself should be able to do this by means of this list and Moulton's work (see bibliography, Moulton, 1911).

### FAMILY AEOLOTHRIPIDAE

1. *Æolothrips floridensis* Watson. (Watson, 1916.)
   Gainesville, April 1913, on oats. Mar., 1915, on oats and corn. A comparatively rare species has been taken a few times on oats and corn always associated with the next species.

2. *Æolothrips bicolor* Hinds. (Hinds, '02.) THE BLACK AND WHITE CEREAL THRIPS.
   Quincy, 1915, on oats (Hooker, '07); March, '09, collected by H. F. Wilson on *Plantago virginica,* corn, onions (Morgan, '13); May 14, 1909, on rutabaga (Morgan, '13).
   Gainesville, April 23, 1914, on oats; Mar., 1915, on strawberries and citrus.

This is our common cereal thrips and is often abundant on oats in the spring and damages them materially.

3. *Franklinothrips vespiformis* (Crawford). (Crawford, '09.)
Orlando, late February to summer on leaves of citrus. *(Æolothrips vespiformis* Back, '12.)

## FAMILY THRIPIDAE

4. *Thrips quinciensis* Morgan. (Morgan, '13.) THE QUINCY THRIPS.
Quincy, collected by A. C. Morgan and G. A. Runner on *Pinckneya pubens* Mx.

5. *Thrips spinosus* Morgan, (Morgan, 13.) THE MAGNOLIA THRIPS.
Quincy, May 1910. Collected by A. C. Mason and G. A. Runner in blossoms of *Magnolia grandiflora.*
Gainesville, May 1915-17, in blossoms of *Magnolia grandiflora.*
This thrips may be found quite abundantly in practically all Magnolia blooms and has been found nowhere else.

6. *Thrips tabaci* Lindeman. (Redescribed by Hinds, '02, p. 179.) THE ONION THRIPS.
Lake City, 1897-8. On onions, cabbage, cauliflower, and crabgrass *(Panicum sanguinale).* (Quaintance, '98.)
Gainesville, Nov.-June, on onions.
Generally distributed, probably in every onion field in the State, and does great damage every year. It is the most serious enemy of onions in the State. Affected onions are characterized by white blanched and dying tips. For remedies see Bull. 134, Fla. Ag. Exp. Sta. Cosmopolitan in its distribution.

7. *Thrips abdomalis* Crawford. (Crawford, '10, p. 157.)
Quincy, March '09. Collected from tobacco by H. F. Wilson; May 17, 1910, on *Senecio* by G. A. Runner and A. C. Morgan. (Morgan, '13.)
Key West, April 23, 1912. "Miscellaneous collecting" by G. A. Runner and A. C. Morgan. (Morgan, '13.)
Gainesville, Oct.-Nov., 1913, on *Solidago* and other composites.
Extends north to Maryland and Illinois, and west to Mexico.

8. *Plesiothrips perplexus* (Beach). (Beach, '95.) *(Thrips perplexus,* Hinds, '02.)
Quincy, Sept. 8, 1909, on grass. (Morgan ,'13.)
Extends north to Maryland and Iowa, and west to Texas.

9. *Heliothrips haemorrhodalis* Bouche. (Redescribed by Hinds, '02.) THE GREENHOUSE THRIPS.
Miami, Sept. 1915; 1908, collected by P. J. Webster on mango and avocado. (Russell, '09.)
Orlando, on foliage of *Acer rubrum.* (Black, '12.)
Gainesville, Jan. 28, 1913, in a greenhouse; May 1917, very destructive to *Coleus* out of doors.
In the northern states this insect is confined to greenhouses, hence the name. But in Florida it is common about gardens and ornamentals out of doors.

10. *Heliothrips rubrocinctus* (Giard). (Russell, '12.) THE RED-BANDED THRIPS. *(Physophus rubrocinctus,* Giard, '01, p. 263.)
    Miami, collected in 1908 on mango *(Magnifera indica)* and avocado *(Persea gratissima)* by P. J. Webster (Russell, '12), Dec. 1914. July 1914, on mango.
    This insect, introduced from the West Indies, is now abundant on mangoes about Miami, Ft. Myers (Dr. E. W. Berger) Frostproof and West Palm Beach.
    It is a severe pest and causes the leaves to loose their color and ultimately to fall.

11. *Echinothrips americana* Morgan (Morgan, '13, p. 16.) THE SPINY THRIPS.
    Quincy, Sept. '09 on *Magnolia grandiflora* and "Coffee Bean"; May 18, 1910, on Pokeweed. (Morgan, '13.)
    Extends north to Missouri and Maryland.

12. *Limothrips cerealium* Haliday, '82. (Redescribed by Hinds, '02, p. 139.) (L. avena, Hinds.) THE CEREAL THRIPS.
    Quincy, May '10, on oats. (Morgan, '13.)
    Extends north to Massachusetts and Illinois; west to Texas and Kansas. In Europe also.

13. *Chirothrips crassus* Hinds '02.
    Quincy, Oct. and Nov. 1915. (Hooker, 1907.)

14. *Chirothrips manicatus* Haliday ('76). (Redescribed by Hinds, '02 p. 134.)
    Quincy, collected on oats on March 20, 1909, by H. F. Wilson. (Morgan, '13.)
    Extends north to Massachusetts and Iowa; Oregon and British Columbia; Europe.

15. *Scolothrips 6-maculatus* Pergande ('91.) THE RED-SPIDER HUNTER.
    Orlando, spring of 1909. "Found feeding on red-spiders on citrus and several weeds." (Back, '12.)
    Winter Haven, April 1916. (Dr. E. W. Berger, Coll.)
    Extends north to New York and Missouri and Wisconsin; Hawaiian Islands.

16. *Aleurodothrips fasciapennis* Franklin. THE WHITEFLY THRIPS.
    Orlando, March and fall of 1909. (Back, '12.)
    Gainesville, Oct. 2, 1912, on citrus leaves.
    Feeds on whiteflies but is too scarce to be of much importance.

17. *Odontothrips phaleratus* (Haliday). *(Thrips phalerata,* Haliday.)
    Quincy, on *Plantago virginica,* H. F. Wilson. (Morgan, '13.)

18. *Frankliniella fusca* (Hinds). *(Euthrips fuscus.* (Hinds, '02.) THE TOBACCO THRIPS. *(Enicotianae* Hinds, '05.)
    Quincy, on tobacco 1905 (Hooker, '07); March 1909, on *Plantago virginiana,* tobacco and life-everlasting, H. F. Wilson collector; May, on peanuts and sorrel. (Morgan, '13.) Tobacco, cocklebur *(Xanthium glabratum),* dewberry, mustard and shepherd's purse. (Chittenden, '04).
    Gainesville, April 23, 1914, on oats; Feb. 4, 1915, on turnips. March 1915, on strawberries.

Extends west to Texas; north to Massachusetts and Michigan and South Dakota. A common pest of tobacco.

In the original description Hinds states that the ocelli are smaller than the facets of the eyes. While this is true in many of the specimens collected at Gainesville, in others the ocelli are larger. This character is variable as is also the color and the presence of wings.

19. *Frankliniella floridana* n. sp.

FEMALE, *Measurements.* Total length 0.7 mm. Head, length 0.09 mm., width 0.13 mm.; prothorax, length 0.07 mm., width 0.17 mm.; mesothorax 0.19 mm wide; width of abdomen in widest place 0.20 mm.; antennae, segment 1, 21; 2, 29; 3, 37; 4, 40; 5, 36; 6, 45; 7, 11; 8, 13 microns.

*Color* of the body bright yellow with brown blotches in center of thorax. The posterior margins of the first abdominal segments very dark, forming five narrow conspicuous bands across the dorsal surface.

*Head* pale yellowish gray with a darker area about the ocelli; deeply retracted into the prothorax; anterior margin slightly rounded, bearing two moderately long and thick but pale spines, similar but smaller spines along the sides.

*Eyes* large, not protruding, deep red. Ocelli large, posterior pair separated from the eyes by more than the width of the ocelli; orange yellow bordered and nearly surrounded by deep orange crescents which are wider than the ocelli. These crescents are separated from each other by a space narrower than the crescents. *Mouth cone* long, narrow, reaching entirely across the prothorax. *Antennae* inserted so far below the margin of the head as to completely hide the first segment. First and second segments, all but the extreme apex and base of the third, and the basal halves of the fourth and fifth grayish yellow, a little lighter than the head, remainder dark brown, giving the antennae a distinctly ringed appearance. Spines on the basal portion few but moderately long, thick and heavy, dark colored. On the apical portion they are more numerous but pale, short and inconspicuous.

*Prothorax* oblong-oval in outline, anterior margin slightly and the sides markedly convex, surface obscurely reticulated, a large triangle in the center conspicuously outlined in dark brown, destitute of conspicuous spines.

*Mesothorax* widest, with sides and anterior margin strongly convex.

*Metathorax* with straight sides but diverging sharply posteriorly.

*Legs* moderately long and slender, yellowish-gray with the tarsi and a large spot on the femora brown.

*Wings* light gray with two dark bands across the basal third, 19 spines on the fore veins and 22 on hind; dark, thick, heavy; four near the base of the fore vein short, others long. Hairs on the margins long but few in number.

*Abdomen* short; sides of the anterior portion, first five segments, arched, of the remainder straight and sharply converging. Anteriorly the spines are short and inconspicuous, posteriorly rather short but heavy.

Described from several specimens taken from velvet beans *(Stizilobium)*, Gainesville, Fla., July 1918. Type in the author's collection. Male not seen.

This species is about the size of the California species *F. minutus* as given in the original description, but differs markedly in color, position of the posterior ocelli, length of the mouth cone, and other characters. It is a very distinct species.

20. *Frankliniella occidentalis* (Pergande.) (Redescribed by Hinds, '02, p. 152).
 *(Euthrips occidentalis* Pergande, '91).
 Dade City, May 12, 1910, on beans, collected by Hunter and Morgan. (Morgan, '13).
 Manatee, March 1911, on mango, H. F. Schultz, collector. (Morgan, '13.)

21. *Frankliniella stylosa* Hood.
 *(Euthrips floridensis* Morgan, '13, p. 5).
 Quincy, on *Asclepias variegata* L and in blossoms of *Catalpa catalpa.* Morgan, '13.
 Extends north to Maryland.

22. *Frankliniella bispinosus* (Morgan, '13.) THE 2-SPINED FLOWER THRIPS.
 Described from Dade City where it was taken in blooms of *Yucca,* May 1910.
 Gainesville on oats, April '14; roses, April 1912; blooms of compositae, Oct. 1913.
 Miami, April 1916, on avocado blooms which it severely damages.

23. *Frankliniella bispinosus projectus* Watson (Watson, '15.) THE FLORIDA FLOWER THRIPS.
 Gainesville, has been taken every month in the year in roses, and could be taken almost any day and in a great variety of blossoms, but mostly in those of an open structure. Our most common thrips. Begonia (Nov.), tomatoes (March-May), compositae (Oct.-Dec.), *Aesculus pavia* (Mar.), peaches (Jan.-Mar.), *Persea* (March), peas (April), petunias, roses, *Cornus floridensis,* wild plum (Feb.), *Cercis canadensis* (Feb.), cherry laurel (Feb.), citrus; Ft. Ogden, citrus; Gulfport, on sea grape *(Cocolobus floridana)* Oct. 1913; Dania, Ft. Lauderdale and Pompano, on tomatoes, Feb. 1913, White City.
 Not usually found in blossoms with a tube but the petunia is an exception. Prefers light colored, white or yellow blossoms.
 Certainly most and probably all, the insects that have been mentioned in the Florida literature as *Euthrips tritici* belong to this or the preceding variety. The writer has not seen typical *Euthrips tritici* from Florida, but has collected it as far south as Swannanoa, N. C., and has it from Atlanta, Ga., and Alvin, Texas. It is at once told from either of the above varieties by the second segment of the antennae which is asymmetrical. In both of the varieties there are on the dorsal surface of this segment, two prominent spines. In var. *projectus* in addition this segment is prolonged anteriorally on the dorsal side so as to project over the third segment. This is particularly marked in the male. In the female the segment is, in addition, very long.

24. *Bregmatothrips gracilis* Hood & Williams ('15).
    Orlando, Nov. 5 and 8, 1914, C. B. Williams, collector.

25. *Pseudothrips inequalis* Beach ('96). (Redescribed by Hinds, '02, p. 146.)
    Quincy, May 17, 1910, on *Senecio.* (Morgan, 13.)
    Gainesville, Nov. 1913, on wild Begonia.
    Extends north to Maryland and Iowa.

26. *Heterothrips arisaemae,* Hood. THE INDIAN-TURNIP THRIPS.
    Quincy, March 1909, on honeysuckle and *Rhodendron ulmiflorum,* H. F. Wilson, collector. (Morgan, '13.)
    Extends north to Virginia and Illinois.

27. *Heterothrips aesculi* Watson ('15). THE BUCKEYE THRIPS.
    Gainesville, Mar. 1914, April 1915, in blossoms of *Aesculus pavia.* Very common in blossoms of this plant.

## KEY TO NORTH AMERICAN SPECIES OF HETEROTHRIPS

I. Prothorax twice as long as the head; antennae with apparently nine segments.

  a. Antennae without circles of distal sensoria on segment 4.

    b. Segment 3 light yellow, palest at the base; segment 4 brownish, palest toward the base; articulations of segments brown, not clear; wings brown, paler at base. Anterior femora shading to yellow at apex; fore tibiae yellow, shaded with brown laterally; tarsi yellow....*H. salicis* Shull.

    bb. Segment 3 yellow with white bands; segment 4 yellow to brown, lightest at the apex; some articulations brown, others clear; wings brown with a broad white band near the base. Anterior femora shading to brownish yellow at the apex; fore tibiae brownish yellow; tarsi brownish yellow. ........................................................*H. aesculi* Watson.

  aa. Antennae with distal circles on segment 4; segments 1 and 2 slightly lighter than the body, shaded laterally with black; segment 3 light yellow, with a narrow sub-basal white band; distal third shaded with brown; segments 4-9 uniform light blackish brown except band of sensoria on segment 4. Wings blackish brown with a broad white band near the base. Legs concolorous with the body except tarsi and distal part of fore tibias which are yellow. ........................................................*H. arisaemae* Hood.

II. Prothorax less than twice as long as head.

  a. Antennae with apparently ten segments; circles of sense areas on segments 4 and 5 (corresponding to segments 3 and 4 of other species of Heterothrips) light yellow; all others dark brown. Wings light brown, basal one-sixth clear. *H. decacornis* Crawford.

  aa. Antennae with nine segments.

    b. Posterior margins of abdominal tergites not fringed with scales.

      c. Abdomen not pubescent ................*H. borinquen* Hood.

cc. Abdomen closely pubescent; thorax finely striate.

d. Third antennae segment about 3.6 times as long as greatest width, grayish yellow. *H. analis* Hood.

dd. Third antennal segment less than 3 times as long as wide; pale yellow with orange pigment. ....................*H. vitis* Hood. (Hood 1916.)

bb. Posterior margins of abdominal tergites 1-7 fringed with chitinous scales ..........................................*H. pectinifer* Hood.

## FAMILY MEROTHRIPIDAE

28. *Merothrips Morgan* Hood.

Pine Key, Jan. 1914. Found by Mr. R. C. Shannon in shell and debris. Taken by Mr. John B. Henderson.

Extends north to Maryland and Illinois.

## FAMILY PHLOEOTHRIPIDAE

29. *Anthothrips niger* Osborn. (Redescribed by Hinds '02, p. 188.)

Quincy, 1905, on oats, wheat and tomatoes (Hooker, '07); March-May on *Plantago virginica,* rye, corn, rutabaga, oats, tomatoes, cocoa-grass. A. C. Morgan and H. F. Wilson. (Morgan, '13.)

30. *Anthothrips dozieri* n. sp.

♀.—*Measurements.* Length 1.5 mm. Head, length 0.187 mm., width 0.187 mm.; prothorax, length 0.16 mm., width 0.267 mm.; mesothorax, width 0.31 mm.; abdomen, width ———; tube, length 0.126 mm., width at base 0.069 mm., at the end 0.035 mm.; antennae, segment 1, 24; 2, 46; 3, 53; 4, 53; 5, 51; 6, 37; 7, 29; 8, 27 microns; total length 0.312 mm.

*Color* uniformly dark reddish brown except segments 3-6 of antennae. Legs 3-5 yellow, base of 6 yellowish-brown, apex light brown. Eyes reddish brown.

*Head* square; cheeks slightly arched and somewhat converging posteriorly. Ocelli large, posterior pair situated well forward, opposite the anterior third of the eyes whose margins they nearly touch, concolorous with the eyes. Mouth cone rather long and acute, reaching nearly to the posterior border of the prothorax. Post-ocular spine short and slender, tipped with a small and almost colorless but distinct knob as are all the spines on the anterior part of the body.

*Antennae* 8-segmented; segments rounded, the fourth somewhat thicker than the others. Sense cones and spines short, light-colored, and inconspicuous.

*Prothorax* wider than long, sides arched and converging markedly anteriorly; knobbed spines on both the anterior and posterior angles short.

*Mesothorax* somewhat wider, sides nearly parallel. One large, knobbed spine along the margin opposite the base of the wing. Other spines small and not knobbed.

*Legs* short and slender, weak, fore femora not thickened.

*Wings* well developed. Membrane reaching three-fourths the length of the abdomen; decidedly constricted in the middle. Hairs of the fringe long and nearly equal in length; seven of a second row present.

*Abdomen* swollen posteriorally. Rather long spines on the posterior portion, not knobbed. Tube tapering markedly, its length exceeded by six of the longer terminal spines.

Described from a single female.

Collected from Hop Hornbeam *(Ostrya virginiana)* by beating, Mar. 1917, by H. L. Dozier.

Type in the author's collection.

In the author's key (Entomological News, XXVII, p. 129) this species goes to *A. Flavipes* Jones, but it differs markedly in its size, relative length of antennal segments, and the color of the antennae and tarsi.

## KEY TO NORTH AMERICAN SPECIES OF ANTHOTHRIPS

I. Postocular spines wanting; antennae almost uniformly brown except segment 3 and base of 4, which are light brown.—*A. niger* Osborn.

II. Postocular spines well developed.

  a. Postocular spines and most of those on the posterio-lateral margin of abdominal segments knobbed.

    b. Total length 2.2 mm.; only the base of antennal segment 3 yellow; wings with 10-12 hairs of a second row. *A flavipes* Jones.

    bb. Total body length 1.5 mm.; antennal segments 3-5 yellow; 7 hairs of a second row present. *A. dozieri* n. sp.

  aa. Posterior and abdominal spines not knobbed.

    b. Apex of femora with a small anteriorally directed triangular tooth within; antennae uniformly brownish-black. —*A. nigricornis* Jones.

    bb. Apex of femora without such tooth.

      c. Segments 3-6 of antennae bright yellow, abdominal spines (except those of the tube) slender and rather faint. —*A. verbasci* Osborn

      cc. Segments 3-6 of antennae light brown, abdominal spines stout and conspicuous.—*A. Variabilis* Crawford.

      ccc. Only segment 3 of antennae wholly bright yellow; abdominal spines short and inconspicuous. —*A. floridensis* Watson

31. *Anthothrips verbasci* Osborn. (Redescribed by Hinds '02.) (THE MULLEIN THRIPS.)
Quincy, on corn, May. (Morgan, '13.)

32. *Anthothrips floridensis* Watson. ('16.) ..(THE FLORIDA ANTHOTHRIPS.)
Gainesville, April 22, 1914, on maize.

33. *Trichothrips amplipennis* Morgan. ('13, p. 33.)
Quincy, May 15, 1910. On *Hypericum solabriforme.* (G. A. Runner and A. C. Morgan). (Morgan, '13.)

34. *Trichothrips terminalis,* Hood & Williams ('15).
Orlando, collected from stump of a tree, Nov. 15, 1914, by C. B. Williams.

35. *Trichothrips fuscus* Morgan ('13, p. 36).
Quincy, May 21, 1910, swept from Spice-bush (Morgan, '13).

36. *Symphyothrips punctatus* Hood & Williams ('13).
Orlando, Jan. 21, 1913. Collected in body of orange tree by W. W. Yothers.

37. *Acanthothrips magnafemoralis* Hinds ('02, p. 199). (BIG-LEGGED THRIPS.)
Miami, Hinds '02. Type locally. "Food plant unknown." "Under bark of various trees and in dried leaves." North to Massachusetts and Illinois. (Hood, '17).

38. *Cephalothrips yucca* Hinds ('02, p. 194). (THE YUCCA THRIPS.)
Quincy, May 1910, on Yucca (Morgan, '13).
Extends north to Massachusetts and South to Barbadoes. (Hood, '17.)

39. *Cryptothrips floridensis* Watson ('13). (THE CAMPHOR THRIPS.)
Satsuma the original locality, Nov. 1912. W. O. Richtman collector. On camphor at all seasons, Glen St. Mary, Tampa, St. Petersburg, Lakeland, Macclenny. This would seem to be an introduced species, as it is not found in many localities in Florida. It has recently been found in Alabama and New Orleans, always on camphor. The writer has received specimens from Ceylon.

40. *Cryptothrips pini* Watson ('15). (THE PINE THRIPS.)
Gainesville, March, May, 1914. Common on pine trees among the needles.

41. *Cryptothrips citri*, n. sp.

FEMALE. *Measurements.* Total length 1.4 mm. Head, length, 0.16 mm., width 0.14 mm.; prothorax, length, 0.17 mm., width (including coxae), 0.28 mm.; abdomen, greatest width 0.27 mm.; tube, length 0.12 mm., width at base 0.053 mm., at apex 0.033 mm.; antenna, segment 1, 22; 2, 42; 3, 50; 4, 53; 5, 44; 6, 41; 7, 41; 8, 28 microns. Total 0.32 mm.

*Color* brown,, tibiae, tarsi, and third antennal segments yellowish-brown.

*Head* rounded in front; widest immediately behind the eyes and converging slightly behind; sides slightly convex; surface smooth; postocular spines moderately stout, about 50 microns long, knobbed. *Eyes* medium sized, orange by reflected light, black by transmitted light in balsam mounts; facets large. *Ocelli* yellow; the anterior facing obliquely upward; the posterior pair widely separated, contiguous with the margins of the eyes about .4 of the distance from the anterior ends. *Mouth cone* very broad at base, a little broader than the posterior end of the head, about .6 as long as broad, very rounding at the apex, not reaching the middle of the prothorax.

*Antennae* 8-segmented, nearly 1.5 times as long as the head. Segment 1 and base of 2 concolorous with the head, apex of 2 and segments 4 to 8 light brown, 3 yellow. Spines and sense cones short and light in color, inconspicuous.

*Prothorax* triangular in outline, the posterior angles very rounding, each bearing a moderately long, knobbed, light-colored spine. On each side there is a somewhat longer spine and on each anterior angle a shorter one.

*Metathorax* a little norrower than the prothorax; sides converging posteriorly; destitute of conspicuous spines. *Legs* of medium length. Fore femora considerably enlarged. Legs provided with a few short hairs. *Wings* reaching tip of abdomen. Fore pair constricted in the middle. fringed with long hairs; near the apex are three or four hairs of a second row.

*Abdomen,* first three segments destitute of conspicuous spines but posterior segments bear progressively longer ones and the last segment a pair of very long but pale ones. Tube rather small.

Described from three specimens collected at Fruitland Park, Fla., in Nov. 1916, under the loose bark of a citrus tree. This tree was affected with gummosis, a bark disease, and the bark was hanging in loose flakes. The insects were found under these flakes. Type in the author's collection.

Males unknown.

## KEY TO NORTH AMERICAN SPECIES OF CRYPTOTHRIPS

I. Antenna 8-segmented.
  a. With prominent post-ocular spines.
    b. Color uniformly black except the tarsi which are blackish brown; body length about 2.22 mm. ..............*C. carbonarius.*
    bb. Body color dark yellowish brown. Post-ocular spines knobbed.
      c. About 1.7 mm. long. Head twice as long as wide. A dark spot behind each ocellus. Antennal segment 3 much shorter than 4 ................................*C. salicis* Jones.
      cc. About 1.4 mm. long. Head little longer than wide. Without dark spots behind each ocellus. Antennal segment 3 nearly as long as 4 ..........................*C. citri* n. sp.
  aa. No post-ocular spines. Color dark brown to coal black.
    b. Antenna black but segment 3 with two brownish yellow bands. Body length about 2.7 mm. *C. rectangularis* Hood.
    bb. Antennal segments 3 to 6 clear yellow, 8 and tip of 7 yellowish-brown. Body length about 1.9 mm. *C. floridensis* Watson
    bbb. Antennal segment 3 brownish yellow; others brown, darker at tip. Body 1.7 mm. Antenna 7-segmented. *C. junctus* Hood.

42. *Barythrips sculpticauda* Hood & Williams ('15).
Orlando Nov. 5, 1914. Collected from a pine stump by C. B. Williams.

43. *Letpthothrips mali* Fitch. (THE BLACK GARDEN THRIPS.)
*(Cryptothrips aspersus,* Hinds '02. *Phyllothrips aspersus* Hood '08., *Leptothrips aspersus,* Hood '09).
Quincy, on magnolia, beans, coffee-bean, cotton, *Cersis,* etc. (Morgan, '13.)

Orlando, "All times of the year on citrus foliage." (Back, '12.)
Key West, "Miscellaneous collecting." Runner & Morgan. (Morgan, '13.)
Gainesville, on leaves of citrus at all seasons, radishes, Nov. 19, 1914; mustard and turnips, Jan. 1915; abundant on avocados 1915. On grasses. Our most common black Thrips.
Extends north to Massachusetts; west to California and South to Panama and Barbadoes. (Hood, '17.)

44. *Haplothrips* (?) *bellus*, Hood & Williams ('15).
Orlando, Nov. 8, 1914, on rushes.
Leesburg, Nov. 16, 1914, "From grasses at edge of canal".
Emeralda, Nov. 17, 1914, on rushes. All collected by C. B. Williams.

45. *Haplothrips statices* Holiday.
"Florida" (Hood, '17).
Extends north to New York and Michigan and west to California and Oregon.

46. *Zygothrips bicolor* Hood & Williams ('15).
Orlando, Nov. 5 to 8, 1914, from Spanish moss on pine tree, on bamboo, on rushes. E. B. Williams, collector.
Emeralda, Nov. 17, on rushes. E. B. Williams, collector.

47. *Phloeothrips raptor* Crawford ('10).
Quincy, "Miscellaneous collecting." (Morgan, '13.)

48. *Phloeothrips floridensis* Watson ('13).
Gainesville, under bark of citrus in greenhouse. Jan. 1913.

## KEY TO NORTH AMERICAN SPECIES OF PHLOEOTHRIPS

I. Postocular spines long and conspicuous.
  a. Segment 3 of antennae longer than 1 and 2 together; body color dark reddish brown; antennae light brown.
    b. Head nearly 1.3 times as long as wide; antennae 1.3 as long as head; segment 3 more than 1.5 times as long as 1 and 2 together ........ *P. jennei* Jones.
    bb. Head slightly more than 1.3 times as long as wide; antennae 1.5 times as long as head; segment 3 about 1.1 times as long as segment 1 and 2 together; males with teeth at apex of fore femora. ........ *P. armiger* Jones
  aa. Segment 3 of antennae shorter than 1 and 2 together; antennae mostly brown or with only the bases of segments 3 to 7 yellow.
    b. General color yellowish brown, with considerable irregular red hypodermal pigmentation; antennae twice as long as the head or nearly so. Cheeks slightly arched.
      c. Legs grayish brown; body length 1.68 mm.; postocular bristles knobbed; mouth cone reaching across prothorax ........ *P. pergandei* Hinds.
      cc. Femora brownish yellow; tibiae and tarsi yellow; body length 2.5 mm.; poctocular bristles not knobbed; mouth cone reaching two-thirds the distance across phothorax ........ *P. floridensis* Watson

bb. General color brown; fore tibiae and all tarsi light brown; cheeks strongly arched; antennae 1.5 times as long as the head. ........ *P. raptor* Crawford.

bbb. General color dark brown, tibiae and tarsi bright yellow; cheeks nearly straight; antennae 1.75 times as long as head. ........ *P. uzeli* Hinds.

II. Postocular spine wanting; general color dark mahogany brown, with many small white pigmental markings along head, thorax, abdomen and legs. ........ *P. maculatus* Hood

49. *Liothrips flavoantennis* Watson ('16). (YELLOW-HORNED THRIPS.)
Gainesville, Fla., April 23, 1914. On wild grape.

50. *Liothrips caryae var. floridensis* Watson ('16). (THE HICKORY-GALL THRIPS.)
Gainesville, Fla., May and June 1914-16. In galls of *Phylloxera* on hickory.

51. *Gynaikothrips useli* Zimmerman. (THE CUBAN LAUREL THRIPS.)
*(Mesothrips ficorum,* Marchal, *Liothrips bakeri* Crawford.)
Key West on *Ficus* (Russell, Bur. Ent. Bull. 99).
Miami, Fla., Wilmon Newell. A severe pest.

52. *Anophothrips megaceps* Hood and Williams ('15.).
Emeralda, Fla., Nov. 17, 1914, E. B. Williams, collector.

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